INSTRUCTION BOOK

For

VHF R-F UNIT TYPE 95901

Manufactured By
WILCOX ELECTRIC COMPANY, INC.
Kansas City 6, Mo., U.S.A.

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108 - 132 Mc.

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VHF R-F UNIT TYPE 95901

SECTION I. DESCRIPTION

1. GENERAL.

The Wilcox Electric Company Very High Frequency R-F Unit Type 95901 is a complete radio frequency transmitter exclusive of the power supplies, modulator and control equipment. It is a crystal controlled unit designed for a carrier output of 250 watts for phone transmission in the frequency range from 108 - 132 mc/s. The unit is equipped for dual frequency operation. That is, the unit may be dialed for operation on either of two adjacent channels without returning the r-f unit.

2. APPLICATION OF EQUIPMENT.

The r-f unit Type 95901 is designed for use with the Wilcox Electric Company 99A and 996A Transmitters. The power supplies, modulator, control equipment, cooling air and metering are provided by the equipment of these transmitters when the r-f unit is installed therein. Special provision for these items as well as housing would be necessary for use in other than in conjunction with the 99A or 996A transmitters.

3. TECHNICAL CHARACTERISTICS.

Transmitter type: Crystal controlled oscillator, amplifier frequency multiplier stages, final power amplifier.

Frequency stability: Stability dependent upon crystal characteristics.

Frequency range: Two adjacent present channels (200 kc separation) in the 108 to 132 mc range.

Power output:		250 watts
Type of emission:		Telephone (A3)
Type of modulation:		Amplitude, high level
Keying tone input:	1750 cycles - 23 to 0 db (0.006 or 6 milliwatt reference level)	
Antenna impedance requirements:		52 ohms
Power requirements:		
2000 volt plate supply	300 to 325 ma	
1000 volt plate supply	60 to 100 ma	
600 volt plate supply:		
Key up		0 ma
Key down		125 to 150 ma
150 volt bias supply:		
Key up		50 ma
Key down		45 ma
Tube Complement:		
V1	Oscillator	6AG7
V2	1st Amplifier	2E26
V3	2nd Amplifier	4-65A
V4-V5	Final Amplifier	4-125A (2)
V6-V7	Voltage Regulator	VR-150 (2)
V8	Keying Control	6SN7

Dimensions:

Height	18 in.
Width	7 in.
Depth	21 in.
Weight	34.5 lbs.

4. MECHANICAL DESCRIPTION.

The r-f unit is designed for operation in a compartment of the 99A or 996A Transmitter. The sides of the unit are protected from mechanical injury and are shielded electrically by plates held in place by cowl type fasteners. These plates are easily removed for access to the unit for preventive maintenance or servicing.

5. CIRCUIT DESCRIPTION.

a. Radio Frequency Circuit. The radio frequency circuit of this unit consists of a crystal controlled oscillator, first and second doubler amplifier stages, and a final power amplifier stage. The tuning of the second amplifier doubler plate circuit and the final amplifier push-pull grid and plate circuits is accomplished by the use of variable inductances in these stages.

b. Antenna Coupling Circuit. The antenna coupling circuit consists of a pick-up coil and variable capacitor. The pick-up loop is fixed near the final amplifier plate coil and the degree of coupling is varied by the tuning of the capacitor. The loop is connected to the antenna jack through a short length of RG8/U 52 ohm coaxial cable.

c. Keying Control Circuit. This circuit consists of an input circuit, a keying control tube and a keying relay. Under key-up conditions this circuit places a high bias on the oscillator and first amplifier stages. The second doubler amplifier and the final amplifier are biased beyond cutoff. An oscillator bias time delay circuit prevents removal of excitation from the following amplifier stages until they have been biased to cutoff. In this manner abrupt changes in the power amplifier plate currents are minimized.

d. Channel Control Relay. When this r-f unit is selected for transmission, this relay turns on the final amplifier filaments, applies plate voltage to the oscillator, first doubler amplifier and keyer tube, and screen voltage to the oscillator, first and second doubler amplifiers.

e. Voltage Regulator Circuits. Regulated potentials are provided by the use of two voltage regulator tubes. One VR 150 is used for regulating the voltages on the oscillator and first doubler amplifier screens and the keyer tube plates. The bias voltages for the oscillator, first doubler-amplifier, and the final amplifier grid circuits are maintained by the second VR 150 tube.

SECTION II. INSTALLATION

6. INSTALLATION OF COILS AND TUNING DISKS.

The r-f unit is shipped with a set of coils and tuning disks installed for operation on the specified frequency. Additional coils and tuning disks are supplied to cover the complete tuning range of 108 to 132 mc. Table I gives the coil designations and tuning disk diameters for operation on other frequencies in the 108 to 132 mc range. Coils L5, L7 and L9 are tuned by varying their inductance. This is accomplished by the tuning disks which act as a shorted turn. Four disks of the same specified diameter must be mounted on each control shaft featuring this method of tuning.

Table I. Coil Designation and Tuning Disk Diameter.

Coil and Tuning Disk	108 to 118 mc.	118 to 125	125 to 132 mc.
Oscillator Plate	L2A	L2B	L2B
1st Amplifier Plate	L3A	L3B	L3B
2nd Amplifier Plate	L5A	L5A	L5B
2nd Amplifier Plate Tuning Disk	1-1/4"	1-1/4"	1-5/8"
Final Amp. Grid	L7A	L7B	L7C
Final Amp. Grid Tuning Disk	1-1/4"	1-3/4"	1-3/4"
Final Amp. Plate	L9A	L9B	L9C
Final Amp. Plate Tuning Disk	1-3/4"	1-5/8"	1-1/2"

7. INSTALLATION OF CRYSTALS AND TUBES.

Two crystals sockets, designated K1 and K2, are located on the lower chassis. Crystal K2 is normally connected, K1 becoming effective when S1 operates. The tube type numbers are given in paragraph 3 and their positions in the transmitter are marked near the tube sockets. Inspect all tubes carefully for damage in transit before installing.

8. INSTALLATION OF R-F UNIT IN 99A AND 996A TRANSMITTER CABINETS.

After the tubes and crystals have been installed, insert the r-f unit about two-thirds of its length into the desired compartment. Pull the locking mechanism at the bottom of the compartment forward and push the r-f unit against the stop. Now press the knob to draw the r-f unit flush with the front of the compartment.

NOTE: If VHF R-F Unit type 95901 is installed in any of 99A Transmitters Serial Nos. 107 to 121 a special connection is necessary to furnish screen grid voltage to the final amplifier. To make this connection shut off all power to the Transmitter, and open the large back panel door. Note the 32 terminal jack at the bottom of the compartment in which the r-f unit is to be installed. At the right and left side of this jack are two heavy terminals which are numbered A1 and A2 in the 99A Transmitter Instruction Book Schematic Diagram. One of these terminals, A1, is wired for 600 volts direct current. Remove the cylindrical spring covers from these terminals with the point of a knife or other sharp instrument and solder a short jumper between A1 and A2.

SECTION III. CONTROLS AND THEIR USE.

9. R-F Unit Controls.

All controls for the r-f unit are arranged on the front panel. Table II gives pertinent information about these controls. Table III lists the particular currents indicated, by the various positions of the meter selector switch and the corresponding meter scales.

Table II. R-F Controls and Use.

Control Label On Front Panel	Location of Control On Front Panel	Symbol	Function
OSC PLATE	Lower Right	C5	Oscillator Plate Tuning
1ST AMP PLATE	Lower Left	C10	First amplifier plate tuning
2ND AMP PLATE	Center, above lower window	L5	Second amplifier plate tuning inductor
FINAL AMP GRID	Center	L7	Final amplifier grid tuning inductor
FINAL AMP PLATE	Centered above upper window	L9	Final amplifier plate tuning inductor
ANT LOADING	Above FINAL AMP PLATE knob	C17	Antenna Loading Capacitor
- - -	Centered under lower window	S2	Meter Selector Switch
TEST KEY	Left of 2ND AMP PLATE knob	S8	Test Transmission

Table III. Circuits Selected By Meter Selector Switch.

SWITCH POSITION	METER SCALE	Typical Reading Ma	CIRCUIT
OSC PLATE	25	13	Oscillator Plate
1ST AMP GRID	25	1.0	First Amp Grid
1ST AMP PLATE	250	20	First Amplifier Plate
2ND AMP GRID	25	4.0	Second Amplifier Grid
2ND AMP TOTAL	250	90	Second Amplifier Cathode
FINAL AMP GRID	50	20	Final Amplifier Grid
FINAL AMP SCREEN	250	45	Final Amplifier Screen
FINAL AMP TOTAL	500	375	Final Amplifier Total Cathode

10. R-F UNIT ADJUSTMENTS.

The various unit adjustments are listed in Table IV. All these adjustments are made with a screw driver from the front panel with the exception of the tone keying sensitivity control which is located on the lower chassis.

Table IV. R-F Unit Adjustments.

Panel Label	Function	Symbol	Method of Adjustment
OVERLOAD ADJUST	Controls overload relay S6.	R37	To increase overload adjustment turn OVER-LOAD ADJUST counter clockwise.
UNDERLOAD ADJUST	Controls underload relay S7.	R34	To adjust minimum operating current to a higher level turn UNDERLOAD ADJUST counter clockwise.
EXCITATION CONTROL	Controls screen voltage of V2, hence controls excitation.	R21	To increase the excitation turn the EXCITATION CONTROL clockwise
NEUTRALIZING CONTROL	Neutralization of final amplifier tubes V4 and V5.	C22 and C23	To increase neutralizing capacitance turn NEUTRALIZING CONTROL clockwise
R38	Controls sensitivity of keying tube V8, hence sensitivity of keying relay S4.	R38	To increase sensitivity of keying relay turn R38 clockwise

SECTION IV. OPERATION

11. STARTING AND STOPPING PROCEDURE.

The starting and stopping procedure is described in the instruction books for the 99A and 996A Transmitters. Special procedures would have to be taken if this VHF R-f Unit Type 95901 were to be used other than in the 99A or 996A Transmitter cabinets.

12. TUNING PROCEDURE.

a. General. The VHF R-F Unit Type 95901 may be described as follows. The oscillator uses a harmonic mode crystal operating in the third mode. The oscillator is followed by two successive doubler amplifier stages which in turn drive the push-pull power amplifier final stage. The output frequency is four times the harmonic mode crystal frequency.

b. Frequency Coverage of Coils. The entire frequency range of this r-f unit is covered by three sets of coils. Before proceeding with the tuning make certain that the proper coils and tuning disks are installed for the frequency of operation. See Table I, paragraph 6.

c. Preparation of r-f Unit for Tuning.

(1). It is assumed that the crystals and tubes have been installed, and that the r-f unit is in place in the 99A or 996A Transmitter compartment.

(2). The antenna should be connected to the transmitter before proceeding with the tuning. Connect the antenna transmission line terminal to the coaxial jack in the antenna well. The antenna loading capacitor should be set for minimum

loading in the initial adjustments.

(3). Remove the transmitter 2000 volt supply fuse corresponding to the compartment in which the r-f unit is installed.

(4). If the r-f unit is to be tuned to some frequency other than that for which it was tuned at the factory the neutralizing capacitors C22 and C23 may have to be adjusted.

(5). Start the 99A or 996A Transmitter, but do not close the high voltage control button.

d. Oscillator Plate. Turn the current selector switch to OSC PLATE and press the TEST KEY. Adjust the oscillator plate control to give a minimum current indication. The meter should indicate 12 to 15 ma. With the proper adjustment of the OSC PLATE control, the first amplifier grid current should read between 1 to 2 ma with the meter selector switch in the 1ST AMP GRID position. It is preferable to tune the oscillator plate circuit using the first amplifier grid indication because of the greater sensitivity of this circuit.

e. First Amplifier Plate. Turn the current selector switch to 1ST AMP PLATE. Rotate the EXCITATION CONTROL fully clockwise. Press the TEST KEY and adjust the 1ST AMP PLATE control for a minimum current indication. The meter should indicate 20 to 30 ma. Turn the meter selector switch to 2ND AMP GRID, press the TEST KEY and readjust the 1ST AMP PLATE control to give a maximum indication. Rotate the EXCITATION CONTROL counter clockwise until the 2ND AMP GRID current measures 3 to 4 ma.

f. Second Amplifier Plate. Turn the current selector switch to 2ND AMP TOTAL. See paragraph 10 for the adjustment of the EXCITATION control. Close the transmitter HIGH VOLTAGE CONTROL button, but do not replace the 2000 volt fuse. Press the TEST KEY and adjust the 2ND AMP PLATE control for minimum indication of second amplifier total current. The meter should indicate 70 to 100 ma. In tuning the plate circuit of the second amplifier, observe carefully the temperature color of the anode. The tube should not be operated for long periods of time with an anode temperature corresponding to a red color.

g. Final Amplifier Grid. Turn the current selector switch to FINAL AMP GRID and press the TEST KEY. Adjust the FINAL AMP GRID control to give a maximum current indication. The final amplifier grid current should be approximately 20 ma with the EXCITATION CONTROL adjusted for maximum grid current. If it less than 20 ma or the plate dissipation of the second amplifier tube is excessive adjust the coupling of the link turn L12 to the second amplifier plate coil L5.

h. Final Amplifier Plate. Before adjusting the final amplifier plate circuit, the neutralization should be checked as outlined in Par. 13, part a.

(1). Stop the transmitter and install the 2000 volt supply fuse. Start the transmitter and close the HIGH VOLTAGE CONTROL button. Turn the current selector switch to FINAL AMP TOTAL.

> WARNING: Under certain tuning conditions it is possible to overload the final amplifier tubes. Watch the plates carefully for temperature color throughout the final amplifier tuning process. The color of the plates for normal dissipation is bright red with only a trace of orange. Bright orange to white color indicates excessive plate dissipation.

Press the TEST KEY. If the current indication goes above 400 ma or if the tubes overheat, release the TEST KEY quickly, and alternately adjust the FINAL AMP PLATE control and press the TEST KEY until the final amplifier stage is tuned to

resonance as indicated by a minimum FINAL AMP TOTAL current reading. It is more likely at this stage of the tuning process that the final amplifier will not be loaded heavily when the TEST KEY is pressed. In this case the neutralization and the final amplifier grid adjustments should be checked. See Par. 13, parts b and c.

(2). After the neutralization has been checked, retune the final amplifier grid and second amplifier plate circuit to give a maximum final amplifier grid current.

(3). Turn the meter selector switch to FINAL AMP TOTAL and adjust the FINAL AMP PLATE control to give a minimum current indication.

(4). Increase the antenna loading by means of capacitor C17 until the final amplifier total current measures approximately 375 ma. A slight readjustment of the final amplifier plate circuit tuning will be required because of the increased loading.

(5). Finally, the final amplifier plate circuit should be tuned for minimum temperature color of the plates. This results in a slightly sharper tuning than can be obtained with the current indication.

(6). It is suggested that the frequency of the final amplifier be checked with a wave meter or receiver to insure that the tuning procedure has resulted in the desired operating frequency. Reasonable care must be used to make certain the wavemeter or receiver is tuned to the fundamental of the output frequency. Sufficient energy to operate the wavemeter can be obtained by holding it near the inspection window in front of the r-f unit.

13. NEUTRALIZING PROCEDURE.

a. The final amplifier neutralization is adjusted by the NEUTRALIZING CONTROL capacitors C22 and C23. In general, the plates of C22 and C23 will be quite close to the tubes for a frequency of 132 mc, and as far away as possible from the tubes for 108 mc. For intermediate frequencies they should be adjusted proportionately for a preliminary setting and should be equidistant from the two tubes as determined by visual inspection. Adjust C22 and C23 as described above. Remove the 2000 volt fuse. Place the meter selector switch in the FINAL AMP GRID position. Press the TEST KEY and rotate the FINAL AMP PLATE tuning control through resonance while observing the final amplifier grid current. The final amplifier grid circuit may be detuned by this process and at this point the final amplifier grid circuit should be readjusted to resonance. The proper setting of C22 and C23 is indicated by minimum reaction in the grid circuit.

b. Install the 2000 volt fuse. With the meter selector switch in the FINAL AMP GRID circuit, press the TEST KEY. Maximum grid current should be obtained at plate resonance. Readjust C22 and C23 until this condition exists.

c. Place the meter selector switch in the FINAL AMP TOTAL position and press the TEST KEY. The plate current should drop to zero upon releasing the TEST KEY if this stage is properly neutralized. If the steps outlined above in parts a and b have been carried out properly, only a slight adjustment of C22 and C23 will be necessary in case the plate current does not drop to zero.

14. LOADING THE R-F UNIT.

The r-f unit is loaded by adjusting ANT LOADING capacitor C17. The final amplifier total or cathode current of 375 ma corresponds to rated output of 250 watts.

15. OVERLOAD AND UNDERLOAD RELAY ADJUSTMENT.

The overload relay should be adjusted to trip out at approximately 400 ma when the r-f unit is operating at the normal output 250 watts. The underload relay should

be adjusted to operate at about 300 ma under the same operating conditions. If the r-f unit is operated at reduced power both settings should be reduced accordingly.

16. TONE KEYING ADJUSTMENT.

Tone keying adjustment is not critical since any keying signal strength from -23 to 0 db will key the r-f unit when the sensitivity control R38 is adjusted to a maximum value. However there is a possibility of line noises keying the unit under this adjustment so the sensitivity should be reduced by turning potentiometer R38 counter clockwise until the signal fails to key the unit and then increasing the sensitivity to a point of positive keying.

SECTION V. PREVENTIVE MAINTENANCE

17. PREVENTIVE MAINTENANCE OPERATIONS.

The Wilcox Electric Company VHF R-f Unit Type 95901 is a precision instrument and should be given the care and maintenance required by such equipment. To insure continued satisfactory performance of the unit it is recommended that a periodic check of the vacuum tubes and transmitter characteristics be obtained and recorded.

SECTION VI. THEORY OF VHF R-F UNIT TYPE 95901

18. GENERAL.

The Wilcox Electric Company VHF R-F Unit Type 95901 is a complete radio frequency unit designed to deliver a carrier power output of 250 watts on either phone or modulated continuous wave operation. The unit is designed to operate on either of two crystal controlled adjacent channels in the frequency range of 108 to 132 mc. Tone keying, channel control, overload and underload, and bias protection circuits are provided. A meter selector switch permits measurement of all the important grid, cathode, screen or plate currents. The unit is designed for operation into a 52 ohm coaxial transmission line. Fig. 1 is a block diagram of the Type 95901 VHF R-f unit, and Fig. 2 is the schematic diagram.

19. CRYSTAL OSCILLATOR.

a. General. A type 6AG7 pentode tube (V1) is used in the oscillator section. A relay provides for switching to either of two crystals. Both the oscillator and first amplifier sections are keyed by the operation of the keying control circuit or the test key.

b. Oscillator Section. The 6SG7 pentode tube is used as an electron coupled oscillator. The screen grid, control grid and cathode are incorporated in a grounded anode type Pierce oscillator circuit. The crystal is connected between the control grid and ground. Harmonic mode crystal operation is obtained by the L-C (L1, C4) cathode return circuit. The screen grid acts as the oscillator anode. The suppressor grid is grounded to provide shielding between the oscillator circuit and the output circuit. Operating bias is provided by voltage drop across the grid return resistor R1. The voltage drop across R3 supplies a disabling bias to V1 for standby operation. When transmission is desired this cutoff bias is removed by the action of the R-C circuit connected to the grid of V1. The radio frequency voltage of the oscillator circuit is coupled to the plate by means of the electron stream in the tube. The plate circuit of the tube V1 operates into a resonant circuit consisting of coil L2 and capacitor C5. The frequency of this stage is one-fourth the final amplifier operating frequency. Capacitor C6 bypasses r-f current in the plate circuit to ground. Proper screen voltage is supplied to the screen of V1 from the voltage regulator VR 150 (V6) and dropping resistor R4. Plate voltage for this

tube is supplied from a +600 vdc source through voltage dropping resistors R22, R12 and the plate coil L2. The plate circuit of tube V1 is coupled to the grid of tube V2 through capacitor C9. Plate current is measured by placing the current meter of the 99A or 996A transmitter into the circuit by means of the meter selection switch. This measurement of plate current is effected by measuring the voltage drop across precision resistor R12.

c. Crystal Switching Relay. The crystal switching relay S1 provides circuits for operating the oscillator at either of two frequencies, Normally the crystals are selected for adjacent channel operation and under such operation the r-f unit does not require retuning because of the relatively small percentage frequency change involved. If relay S1 is open crystal K2 is connected to the grid of the oscillator section of V1. However, if the dialing unit in the transmitter is dialed to the proper number, relay S1 closes placing crystal K1 in the oscillator circuit. The lower contacts of S1 hold the channel control relay S5 closed when the dialing unit is dialed to the position to close crystal switching relay S1. This is necessary because contacts in the dialing unit hold the channel control relay closed only when the transmitter is dialed for crystal K2 operation.

20. FIRST AMPLIFIER

A type 2E26 pentode tube V2 is used as a buffer amplifier and radio frequency doubler. R-f grid current is returned to ground through capacitor C7. Bias voltage is supplied from a voltage divider network composed of R14, R39, R15 and voltage dropping resistors R11 and R5. The r-f voltage applied to the grid of V2 is large enough to cause the flow of grid current. This grid current may be measured by switching R11 across the current meter. The proper screen voltage is supplied to V2 from the potentiometer R21. This variable resistor is placed across the voltage regulator tube V6 to insure a stable screen voltage. The resistor R21 is made variable in order to serve as an excitation control and so enable the operator to change the r-f excitation on the succeeding stages. The plate circuit of tube V2 operates into a resonant circuit consisting of coil L3 and capacitor C10 which is tuned to one-half of the operating frequency of the final amplifier stage. The r-f current is bypassed to ground through capacitor C12. Plate voltage is supplied from the +600 vdc source. Precision resistor R10 is a meter shunt for the indication of plate current. The plate of V2 is coupled to the grid of V3 through capacitor C11.

21. SECOND AMPLIFIER

A type 4-65A VHF power tetrode tube V3 is used as a second buffer amplifier and frequency doubler. R-f grid current is returned to ground through capacitor C13. Bias is supplied to this tube from a voltage divider network composed of R32 and R33 and series dropping resistors R9 and R6 and r-f choke L4. The r-f voltage excitation applied to the grid of V3 is large enough to cause grid current to flow. This grid current is metered by placing the current meter across the precision resistor R9. Screen voltage for tube V3 is obtained from the junction of R24 and R25. The plate circuit of V3 operates into a resonant circuit consisting of inductor L5 and capacitor C15. This resonant plate circuit is tuned to the final operating frequency by L5. Plate voltage is supplied from the +1000 vdc source. The total amplifier screen and plate current is measured by use of meter shunt R16 connected in the cathode circuit of V3. The plate tank coil is coupled to the grid coil of the final amplifier by coupling circuit L12 and L13.

22. FINAL AMPLIFIER

a. General. A pair of 4-125 A power tetrode tubes, V4 and V5, are used in a push-pull Class C amplifier circuit. The final amplifier is plate modulated for phone transmission. The rated output is 250 watts.

b. Final Amplifier. The grid circuit of the final amplifier consists of inductance L7 and tube capacitance. The final amplifier grid circuit is link coupled to the plate circuits of the second amplifier. This circuit is tuned by L7. Grid-plate neutralization is provided by capacitors C22 and C23. Bias is supplied through resistors R7, R8 and L8 from the voltage regulator tube V7. The r-f voltage applied to the grid is large enough to cause the grid to become positive and to cause grid current to flow. The amount of grid current may be increased or decreased as required by adjustment of the excitation control. The r-f choke L8 prevents r-f currents from entering the bias supply.
Resistor R8 provides a meter shunt for measuring grid current. Screen voltage is obtained from the +600 vdc supply through the series combination of resistors R18 and R17 and modulation choke L11. Modulation of the screen voltage is provided by choke L11. Screen current is measured by meter shunt resistor R18. Screen grids and cathodes for these stages are bypassed by capacitors built into the tube sockets of V4 and V5. The plate circuit of the final amplifier stage operates into a resonant circuit consisting of coil L9 and tube capacitance. This circuit is tuned by L9 to four times the harmonic mode crystal frequency. Plate voltage is obtained from the +2000 vdc supply. The total screen and plate current of these two tubes is measured by the meter shunt resistor R35. R-f energy is extracted from the final amplifier plate circuit by a one turn coupling coil L14 which is parallel tuned by capacitor C17. The amount of r-f energy extracted from the final amplifier plate circuit increases as the coupling coil L14 is resonated to the final amplifier operating frequency by the adjustment of capacitor C17. This L-C circuit is designed to operate into a 52 ohm coaxial transmission line.

c. Plate Overload and Underload Protection. The combined total d-c cathode current of the final amplifier tubes V4 and V5 flows through the filament winding of transformer T3 to the overload and underload relays S6 and S7 and through the precision meter shunt R35 to ground.

(1). Overload relay. The contacts of the overload relay S6 are normally closed during operation of the r-f unit, opening only when excessive current flows through the final amplifier tubes V4 and V5. The point at which relay S6 operates is fixed by the adjustable resistor R37. This resistor is adjusted according to the desired carrier output and final amplifier total cathode current. When overload relay S6 operates the general interlock system of the transmitter is broken and final amplifier plate voltage is removed from V4 and V5. Relay S6 recloses immediately and continues to recycle until the overload condition is removed or until protective fuses in the transmitter are blown.

(2). Underload relay. The contacts of the underload relay S7 are closed when the final amplifier total cathode current is above a predetermined minimum value. The point at which S7 operates is fixed by adjusting resistor R34. When the r-f unit is installed in the 99A or 996A transmitter the contacts of relay S7 are connected through the dialing unit and are in series with the coil of the modulator control relay in the modulator control unit. When the contacts of S7 open the modulator control relay removes modulated plate voltage from the final amplifier and prevents damage to the modulation transformer.

d. Neutralization. At the operating frequency of the VHF r-f unit the screen grid leads have enough inductive reactance to cause an appreciable shift in the phase of the plate voltage in respect to the grid voltage. This phase shift may cause the final amplifier tubes V4 and V5 to oscillate in the absence of neutralization. The capacitance built into the sockets of these tubes is sufficient to neutralize this stage below 105 mc. Above this frequency capacitors C22 and C23 add sufficient grid to plate capacitance for neutralization. The plate structure of V4 and V5 serves as one of the plates of C22 and C23 respectively. The neutralizing capacitance is in-

creased by moving the adjustable plates of C22 and C23 closer to the tubes. In general the amount of capacitance required for neutralization increases with an increase in operating frequency. If the neutralizing capacitances are increased too much the grid driving voltage decreases as a result of the capacitive loading action. If the neutralizing capacitances are too small the final amplifier will tend to oscillate when the grid driving voltage is removed.

23. ANTENNA LOADING

The antenna is loaded by adjusting capacitor C17. Maximum loading occurs when capacitor C17 is set for minimum capacitance. The antenna may be a Wilcox 614A Ground-Plane Antenna, a dipole, or any other type of antenna with approximately the same input impedance.

24. BIAS REGULATOR

A type VR 150 tube, V7, regulates the bias voltages for the oscillator, first doubler amplifier and final amplifier grid supply.

25. BIAS PROTECTION

The bias protection relay S3 protects the amplifier tubes against damage and excessive current flow resulting from failure in the bias supply. Relay S3 closes when bias voltage is applied to the r-f bias supply bleeder circuit composed of R32 and R33 and S3. The active contacts of relay S3 energize filament transformer T2 which supplies filament voltage to tubes V1, V2, V3 and V8. The contacts of S3 are also in series with a set of contacts on the channel control relay S5 which energizes the transformer T3. Filament voltage to the final amplifier tubes V4 and V5 is furnished by T3. Should the bias supply fail, the bias protection relay S3 opens immediately and removes filament voltage from all the tubes, thus protecting them from damage.

26. KEYING CONTROL

a. General. Wilcox Electric Company VHF R-f Unit Type 95901 is provided with an electronic keying circuit for use with a 500 to 5000 cycles keying tone. A 1750 cycle tone is normally used. The TEST KEY on the front panel permits the operator to key the r-f unit for test purposes. A direct keying terminal is also provided for use with a local keying circuit or for use with direct keying over a remote line.

b. Keying Control Tube. A twin triode type 6SN7, V8, is used as a keying control tube. The 1750 cycle keying pulse is applied to the input side of T1. Transformer T1 matches the impedance of the keying line to the grid impedance of V8. The tone keying sensitivity control R38 adjusts the level of the 1750 cycle keying signal which is applied to the input grid of V8. Resistor R26 limits the grid current flow in positive half cycles of the keying signal. The input grid of V8 is self biased by cathode current flow through R27. The plate current of the second section is biased to cut off by the voltage developed across R28 and R31. The signal voltage of the first section of V8 develops across R30 and is coupled to the second section grid of V8 through capacitor C19. The plate current of the second section increases and actuates the keying relay S4. Capacitor C21 is a smoothing of filter condenser to hold relay S4 closed during the keying pulse and to prevent chattering.

c. Keying. When the keying relay S4 is open a high bias is connected to the grids of V1 and V2, effectively preventing them from amplifying. This bias is supplied from the network, consisting of R39, R14, R13, and R3, placed across the voltage regulator tube V7. The grids of V4 and V5 are maintained at a value beyond cutoff by the voltage regulator tube V7. The voltage divider network of R32 and R33 across the bias supply provides cutoff bias for V3. When the keying relay is closed

by a keying pulse or when the test key is pressed, R15 is grounded and the proper bias for operation is supplied to V1 and V2 through the action of the R-C time delay circuits in the oscillator and first amplifier stages. When S4 is opened or the test key released the first amplifier stage is biased to cutoff before V1 ceases to oscillate. This results from the design characteristics of the two R-C bias time delay circuits.

27. LOW VOLTAGE PLATE AND SCREEN SUPPLY

The voltage regulator tube V6, maintains the screen of tube V1 at the proper potential through series resistor R4. Series resistors R36 and R20 connected to the +600 vdc supply provide the correct voltage for proper operation of V6. The plate voltage for V1 is obtained from the +600 vdc supply through resistors R22 and R12. The plate of V2 is maintained at the correct voltage by dropping resistors R23 and R10. Resistors R24 and R25 make up a bleeder circuit across the +600 vdc supply. The screen voltage for V3 is supplied from a connection between R24 and R25. Voltage is applied to these tubes only when the channel control relay S5 is closed. A separate circuit supplies screen voltage to tubes V4 and V5 of the final amplifier stage through the series combination of dropping resistors R18 and R17 and the choke L11. This voltage is applied continuously as long as the 99A or 996A transmitter is dialed up for normal operation, even though the r-f unit is not dialed for use. Both circuits are connected to the +600 vdc supply.

28. CHANNEL CONTROL

Channel selection equipment in the 99A or 996A transmitter grounds the operating coils of S5 when the r-f unit is selected for use with crystal K2. If the frequency corresponding to crystal K1 is dialed the crystal switching relay S1 closes and contacts on S1 in turn close channel control relay S5. When relay S5 is closed a channel control pilot lamp on the main control panel of the transmitter is lighted. 220 vac is connected to filament transformer T3 and 500 volts is connected to the networks which supply the plates of V1 and V2, and the screens of V1, V2, V3, V4 and V5. The contacts of bias protection relay S3 are in series with the 220 vac supply to filament transformer T3, so that both channel control relay S5 and bias protection relay S3 must be closed before T3 is energized. The operation of the bias protection relay is discussed in Paragraph 30.

29. METERING CIRCUITS

Meter selector switch S2 switches the current meter on the 99A or 996A transmitter meter panel across the meter shunt in the circuit in which the current is to be measured. The basic movement of the current meter is a full scale deflection of 1 volt and has a resistance of 62 ohms per volt. When the meter is shunted with 112.8 ohms the full scale deflection is 25 ma, when the meter is shunted with a 29.5 ohms the full scale deflection is 50 ma, when the meter is shunted with 4.30 ohms full scale deflection is 250 ma, and when the meter is shunted with 2 ohms the full scale deflection is 500 ma. The 25 ma range is used for measuring the oscillator plate current, the first amplifier grid current and the second amplifier grid current. These switch positions are labeled OSC PLATE, 1ST AMP GRID, and 2ND AMP GRID. The 50 ma range is used for measuring the final amplifier grid current, the meter selector switch for this position is labeled FINAL AMP GRID. The 250 ma meter range is used for measuring the first amplifier plate current, the second amplifier cathode current and the final amplifier screen current. These switch positions are labeled 1ST AMP PLATE, 2ND AMP TOTAL and FINAL AMP SCREEN respectively. The 500 ma range is used for measuring the final amplifier total cathode current when the meter selector switch is in the position labeled FINAL AMP TOTAL. The paragraphs which describe the various amplifier stages give additional information about the metering resistors.

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR. & NO.
C1	Osc. Bias delay	Capacitor: paper 1.0 mfd±10% 400 vdcw	19145	JAN-C-25 CP65B1DE105K
C2	RF by-pass osc. grid	Capacitor: ceramic, 1000 mmf 5% 500 vdcw	23037	Erie HiK Style L
C3	Osc., screen by-pass	Same as C2		
C4	Osc., cathode capacitor	Capacitor: ceramicon, 20 mmfd. ± 2 mmfd	23005	Erie N750K
C5	Osc., plate tuning	Capacitor: air var; 4.5-23.7 mmfd	15142	Sarkes-Tarzian Type H Code 24-P
C6	Osc., plate by-pass	Capacitor: mica, 0.0005 mfd±5% 800 vdcw, 2000 vdct	17185	Aerovox 1468P-0.0005
C7	First dblr-amp grid by-pass	Same as C2		
C8	1st dblr-amp screen by-pass	Same as C2		
C9	Osc. - 1st d-a coupling	Same as C6		
C10	1st dblr-amp plate tuning	Same as C5		
C11	1st d-a - 2nd d-a coupling	Capacitor: mica, 0.0001 mfd, 1200 vdcw	17208	Sangamo B-2310, Type B-25
C12	1st dblr-amp plate by-pass	Same as C11		
C13	2nd dblr-amp grid by-pass	Capacitor: ceramicon, 600 mmf ± 60 mmf	23007	Erie HiK Style K
C14	2nd dblr-amp grid by-pass	Same as C2		
C15	2nd dblr-amp plate capacitor	Capacitor: Plate, R.H Plate, L.H	86020 86021	Wilcox
C16	2nd dblr-amp plate by-pass	Capacitor: Assembly C17	96130	Wilcox

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR. & NO.
C17	Ant. loading adjustment	Capacitor: air var; trimmer 4.6-46.6 mmfd.	15140	American Steel Package Co. Type O #47-L
C18	RF by-pass grid keying control	Capacitor: ceramicon 50 mmfd ± 5 mmfd.	23002	Erie N750K Erie dwg # 315
C19	Keying control coupling, 1st stage to 2nd stage.	Capacitor: ceramic, 5000 mmf ± 20% 300 volts.	23000	Erie HiK Style C
C20	RF by-pass grid of keying control	Same as C18		
C21	S4 filter	Capacitor: molded bakelite, paper 0.1 mfd ± 20% 400 vdcw	19006	Micamold 345-21 Solar MPW 5147A
C22	Final amp. neutralizing	Capacitor: special var.		Wilcox
C23	Final amp. neutralizing	Capacitor: Same as C22		
C24	1st dblr-amp bias delay	Same as C1	19145	
J1	1000 volt supply jack	Receptacle, insulator, thru panel with banana jack	27882	Mykroy EMB750
J2	2000 volt supply jack	Same as J1		
J3	Antenna jack	Receptacle, female Astatic #49269 modified	29703	Wilcox
K1	Crystal	Crystal, type CR-7	47386	Hunt
K2	Crystal	Same as K1		
L1	RF choke	Inductor, choke RF 30 turns #34 SE wire close wound on 100,000 ohn 2 watt resistor	38593	Wilcox

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR. & NO.
L2	Osc. Plate coil	Inductor, osc. coil		Wilcox
		L2A, 108 to 118 mc 6-3/4 T-#26 AWG	42067	
		L2B, 118 to 132 mc 5-3/4 T-#26 AWG	42068	
L3	1st dblr. amp plate coil	Inductor, 1st amp plate		Wilcox
		L3A, 108 to 118 mc 4 T-#16 AWG	42069	
		L3B, 118 to 132 mc 4 T-#16 AWG	42055	
L4	RF choke grid 2nd dblr-amp	Inductor, choke, RF cylindrical shape, axial leads.	38594	Ohmite Z-50
L5	Plate tuning, 2nd dblr. amp	Inductor, 2nd amp plate, 1/4" d soft copper tubing		Wilcox
		L5A, 108 to 125 mc 3 T-3/16" tubing	42077	
		L5B, 125 to 132 mc 2 T-1/4" tubing	42057	
L6	RF choke, plate 2nd dblr-amp	Inductor, choke, RF 1.9 ub.	38592	Ohmite Z-144
L7	Grid tuning, final amp	Inductor, final amp grid		
		L7A, 108 to 118 mc 2 T-#8 AWG	42071	Wilcox
		L7B, 118 to 125 mc 1 T-#8 AWG	42061	
		L7C, 125 to 132 mc 1 T-#8 AWG	42059	
L8	RF choke, grid final amp	Same as L6		
L9	Plate tuning, final amp	Inductor, final amp		
		L9A, 108 to 118 mc 4 T-3/16" tubing	42072	Wilcox
		L9B, 117 to 127 mc 4 T-1/4" tubing	42028	
		L9C, 123 to 136 mc 4 T-1/4" tubing	41976	
L10	RF choke, plate final amp	Same as L6		

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR & CO.
L11	Screen modulation choke, final amp.	Inductor, audio choke 10 henries @ 100 ma.	38113	Audio Dev. AX2163
L12	Second amp. plate coupling	Inductor, 2nd dblr-amp plate coupling 1 T #10 AWG	42058	Wilcox
L13	Final Amp. grid coupling	Inductor, final amp grid coupling 1 T #10 AWG	42060	Wilcox
L14	Antenna	Inductor, RF antenna coupling 1 T-#10 AWG	42056	Wilcox
P1	Connector-RF unit	Receptacle, male 32 contacts.	28609	Cannon DPD-32C2-34P
R1	Osc. grid resistor	Resistor: 82.000 ohms ± 10% 2 watts.	52374	A.S.A. RC-40-BF-823K
R2	Osc. bias delay	Resistor: 120,000 ohms ± 10% 1/2 watt.	53049	A.S.A. RC-20-BF-124K
R3	Osc. bias voltage divider	Resistor: 8200 ohms ± 10% 1/2 watt.	53035	ASA RC-20-BF-822K
R4	Osc. screen dropping	Resistor: 2200 ohms ± 10% 1/2 watt.	53028	ASA RC-20-BF-222K
R5	First dblr-amp grid resistor	Resistor: 22,000 ohms ± 10% 1/2 wat.	53040	ASA RC-20-BF-223K
R6	Second dblr-amp grid resistor	Resistor: 15,000 ohms ± 10% 1 watt.	52276	ASA RC-30-BF-153K
R7	Final amp grid resistor	Resistor: 5000 ohm ± 10% 10 watt, wire wound, cement coated.	50071	Clarostat Mfg. Co. A10F 10C
R8	Final amp grid metering	Resistor; 29.5 ohm, precision 1 watt	50527	I.R.C.
R9	Second amp grid metering	Resistor: 112.8 ohm precision ± 1% non-inductive, ¯1 watt max.	50002	International Resistance Co. WW4
R10	1st amp. plate metering	Resistor: 4.3 ohm precision ± 1% non-inductive, ¯1 watt max.	50001	International Resistance Co. WW4

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR. & NO.
R11	1st amp grid metering	Same as R9		
R12	Osc. plate metering	Same as R9		
R13	Osc. bias voltage divider	Resistor: 47,000 ohms ± 10% 1/2 watt.	53044	ASA RC-20-BF-473K
R14	Bias voltage divider	Resistor: 3900 ohms ± 10% 1/2 watt.	53031	ASA RC-20-BF-392K
R15	Bias voltage divider	Resistor: 470 ohms ± 10% 1/2 watt.	53020	ASA RC-20-BF-471K
R16	2nd amp total metering	Same as R10		
R17	Final amp screen dropping	Resistor: 5000 ohm 115 watt wire wound	50525	Davis Electric
R18	V3 total current metering	Same as R10		
R19	Voltage regulating resistor	Same as R7		
R20	Voltage regulating resistor	Resistor: 10,000 ohm ± 10%, 20 watt, wire wound, cement coated	50095	Clarostat Mfg. Co. A20K
R21	Excitation control	Resistor: variable, 50,000 ohms linear taper, 2 watt carbon type.	54055	Allen-Bradley Type "J"
R22	Osc. plate voltage dropping	Resistor: 30,000 ohm 20 watt.	50526	Clarostat
R23	1st amp. plate dropping	Same as R7		
R24	2nd amp screen dropping	Resistor: 25,000 ohms 20 watt.	50151	Clarostat
R25	2nd amp screen bleeder	Same as R23		
R26	Keyer tube series grid resistor.	Resistor: 0.10 megohms ± 10% 1 watt	52096	ASA RC-31-BF-104K

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

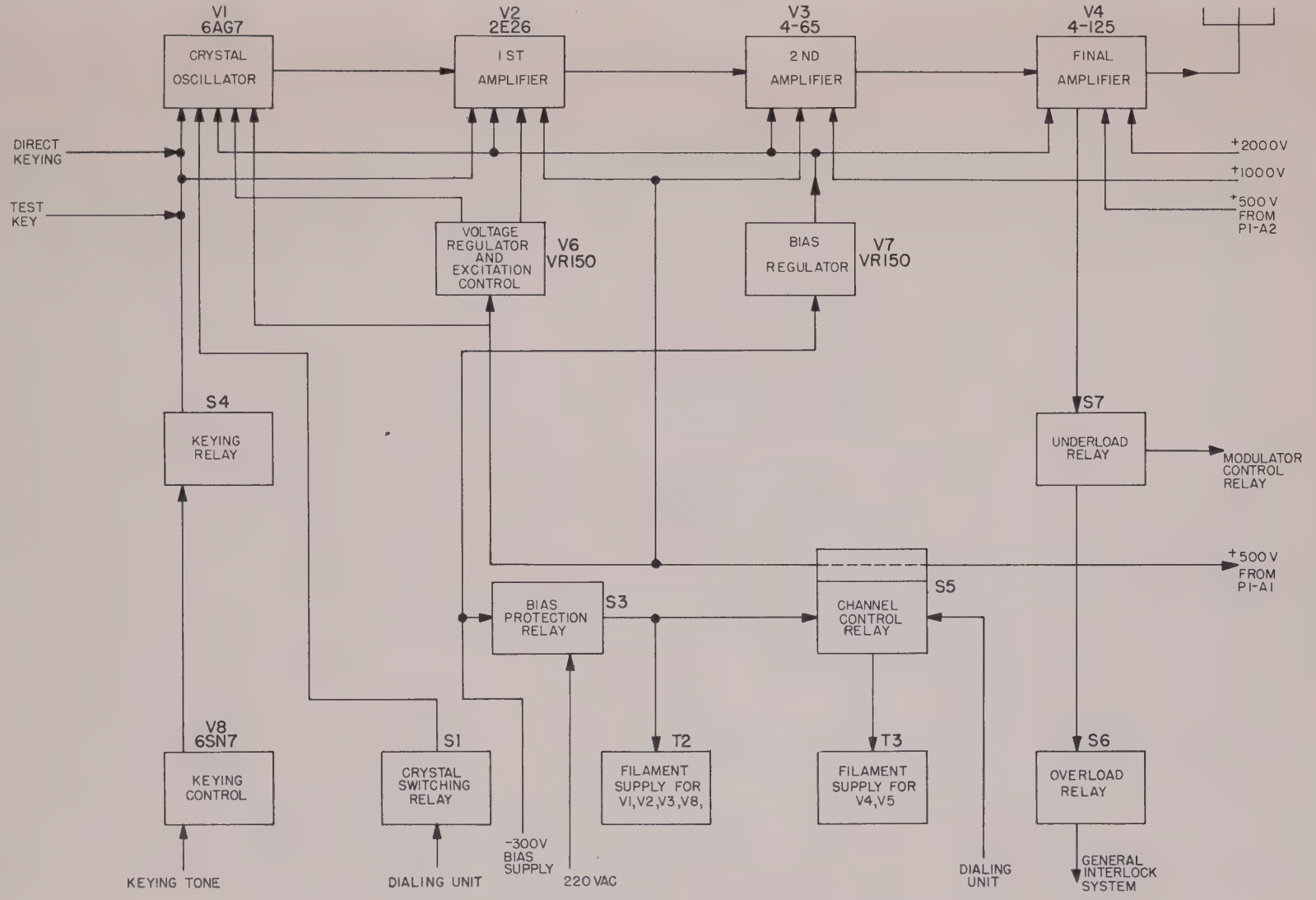
SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR. & NO.
R27	Keyer tube cathode resistor	Resistor: 5600 ohm ± 10% 1/2 watt	53033	ASA RC-20-BF-562K
R28	Keyer tube cathode resistor	Resistor: 2200 ohm ± 10% 1/2 watt	53028	ASA RC-20-BF-222K
R29	Keyer tube grid resistor	Resistor: 0.47 meg-ohm ± 10%	53056	ASA RC-20-BF-474K
R30	Keyer tube plate resistor	Resistor: 0.27 meg-ohm ± 10%	53053	ASA RC-20-BF-274K
R31	Keyer tube fixed bias resistor	Same as R2		
R32	V3 bias voltage dropping resistor	Resistor: fixed 4000 ohm ± 10% 20 watt wire wound	50440	Clarostat #140544
R33	V3 bias voltage divider	Resistor: 2250 ohm ± 10% 10 watt, wire wound cement coated	50067	Clarostat 10C
R34	Underload adjusting resistor	Resistor: variable 50 ohm, 25 watt, wire wound, linear taper vitreous enamel.	54121	Ohmite 0149
R35	V4 total current metering	Resistor: 2ohm precision, ± 1% 1 watt, non-inductive	50000	Shallcross 193
R36	Voltage regulating resistor	Same as R20	50095	
R37	Overload adjusting resistor	Same as R34		
R38	Keyer sensitivity adjustment	Resistor: potentiometer 100,000 ohm variable, 1 watt Audio taper L. H. Logarithmic	54008	Clarostat Mfg. Co. Central N117 IRC
R39	Bias Voltage divider	Resistor; 22,000 ohms ± 10% 2 watts	53240	ASA RC-40-BF-223K

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR. & NO.
S1	Crystal Switching relay	Relay: DPDT, 12 vdc, 250 ohm coil, 2 form "C" contacts, rated 200 watts on non-inductive A-C loads	11562	Advance Elec. Co. K1604
S2	Meter Switching	Switch: Rotary, 2 deck, 11 position, non-shorting 1 circuit 1 deck.	10100	Mallory
S3	Bias protection relay	Relay: DPST 12 vdc, 450 ohm coil.	11517	Advance Elec. Co. 1601
S4	Keying relay	Relay: SPDT, coil 8700 ohms, contact rating 5 amps.	11695	Advance Elec. Co. Type 1200
S5	Channel control relay	Relay, TPDT 12 vdc, 64 ohm coil	11616	Leach Relay Co. 1077 CBF
S6	Overload relay	Same as S1		
S7	Underload relay	Same as S1		
S8	Test Key	Switch: push button SPST.	10004	P.R. Mallory Co. 2001-L
T1	Keyer control input trans.	Transformer, Audio, line-grid 500 ohms ct to 5000 ohms ct. p-p grids pri. balanced to carry 0.01 amp dc on ct. $\pm$2 db 300 to 3000 cps.	40089	Thermador CS4215
T2	Keyer - osc. 1st & 2nd amp filament supply transformer	Transformer, Filament power, pri. 0-220-240 volts Sec. 6.3 v @ 5 amp center tap.	43096	Thermador CS8822
T3	Final amp filament supply transformer	Transformer: filament power, pri. 0-220-240 volts. Sec. 5 v @ 13 a center tap.	43095	Audio Development A5710

PARTS REPLACEMENT LIST
VHF RF UNIT TYPE 95901

SYMBOL	FUNCTION	DESCRIPTION	WILCOX NO.	MFGR. & NO.
V1	Oscillator	Vacuum tube.	6AG7	
V2	First amp. doubler	Vacuum tube.	2E26	
V3	Second amp. doubler	Vacuum tube.	4-65	
V4	Final amplifier	Vacuum tube.	4-125	
V5	Final amplifier	Vacuum tube.	4-125	
V6	Voltage Regulator	Gaseous discharge tube.	VR150	
V7	Bias voltage regulator	Gaseous discharge tube.	VR150	
V8	Keying control	Vacuum tube.	6SN7	

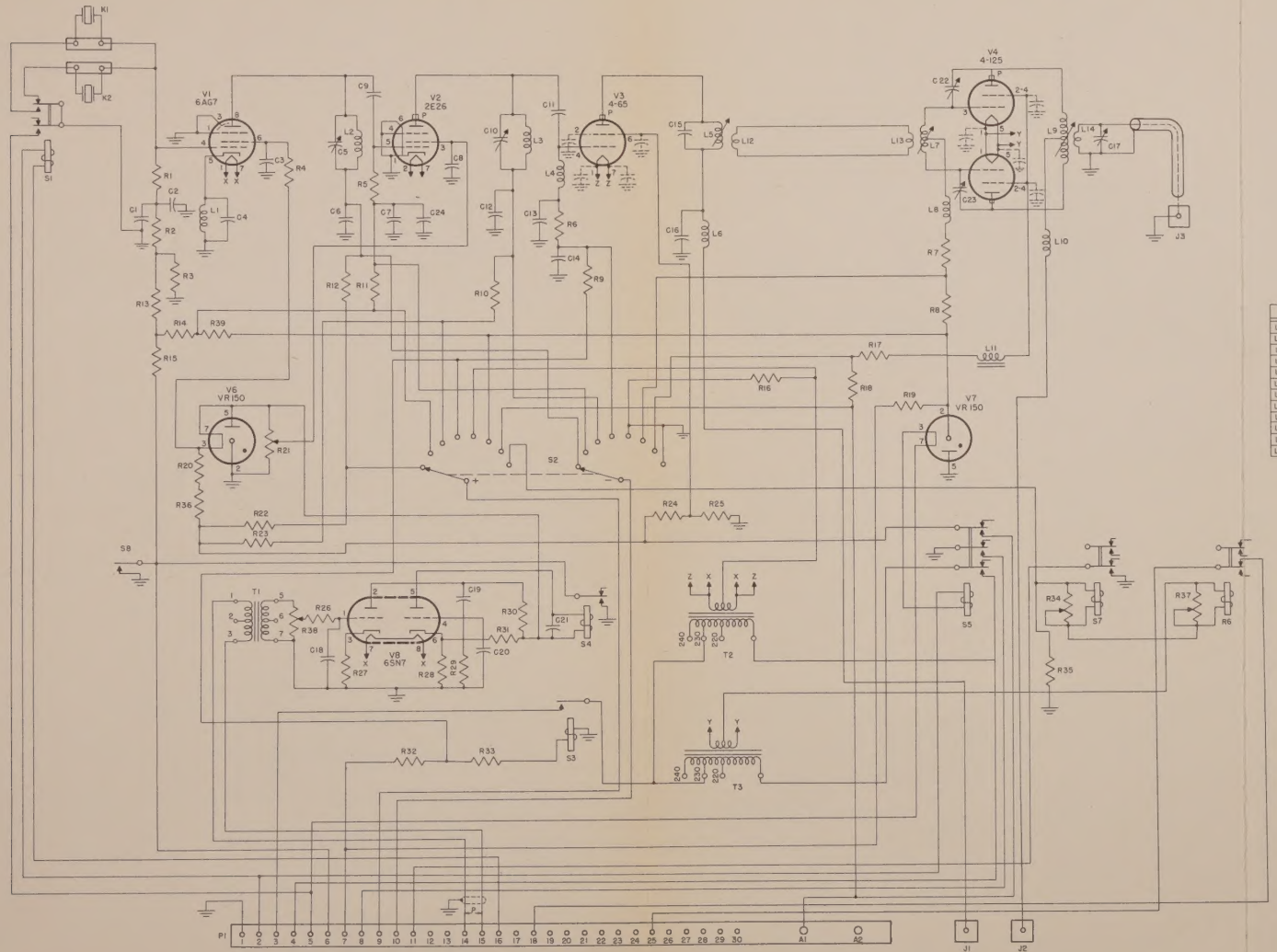


MATERIAL:	
FINISH:	
DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED. ALL DIMENSIONS APPLY BEFORE PLATING. REMOVE ALL BURRS AND SHARP EDGES.	SCALE

WILCOX ELECTRIC COMPANY, INC.
KANSAS CITY, MO.

BLOCK DIAGRAM
VHF R-F UNIT
TYPE 95901

TOLERANCES ANGULAR ± 1/2° DECIMAL ± .005 FRACTIONAL ± 1/64 UNLESS OTHERWISE SPECIFIED	DR. R.L.G. 9-14-50	ENG.
	CH.	APP.
	C106068 H	



PARTS LIST

NO	DESCRIPTION	PART NO
R19	5000 Ω 10 WATT	50071
R20	10000 " 20 "	50095
R21	50000 VAR 2 "	54055
R22	30000 Ω 20 "	50526
R23	5000 " 10 "	50071
R24	25000 " 20 "	50151
R25	25000 " 20 "	50151
R26	100000 " 1 "	52096
R27	5600 " ½ "	53033
R28	2200 " " "	53028
R29	470000 " " "	53056
R30	270000 " " "	53053
R31	27000 " 2 "	53041
R32	4000 " 20 "	50440
R33	2250 " 10 "	50067
R34	50 VAR 25 "	54121
R35	2 Ω 1 "	50000
R36	10000 " 20 "	50095
R37	50 VAR 25 "	54121
R38	100000 VAR 1	54008
R39	22000 Ω 2 "	53240
S1	RELAY - CRYSTAL	11562
S2	SWITCH - METER	10100
S3	RELAY BIAS PROTECTION	11517
S4	" KEYING	11695
S5	" CHANNEL CONTROL	11616
S6	" OVERLOAD	11562
S7	" UNDERLOAD	11562
S8	SWITCH - KEY	10004
T1	TRANSFORMER-AUDIO INPUT	40089
T2	" FILAMENT	43096
T3	" "	43095
V1	TUBE-OSCILLATOR	6AG7
V2	" 1ST AMPL	2E26
V3	" 2ND "	4-65
V4	" FINAL "	4-125
V5	" " "	4-125
V6	" VOLTAGE REGULATOR	VR150
V7	" " "	VR150
V8	TONE	6SN7

INDUCTOR LIST

L2A	108 TO 118 MC		42067
L2B	118 TO 132 MC		42068
L3A	108 TO 118 MC		42069
L3B	118 TO 132 MC		42055
L5A	108 TO 125 MC		42070
L5B	125 TO 132 MC		42057
L7A	108 TO 118 MC		42071
L7B	118 TO 125 MC		42061
L7C	125 TO 132 MC		42059
L9A	108 TO 118 MC		42072
L9B	118 TO 123 MC		42028
L9C	125 TO 132 MC		41976

PARTS LIST

NO	DESCRIPTION	PART NO
C1	1 MFD 400 V	822006
C2	1000 MMF 500 "	23037
C3	1000 MMF 500 "	23037
C4	20 MMF 500 "	23005
C5	4.5-23.7 MMF	15142
C6	.0005 MFD 800 V	17185
C7	1000 MMF 500 V	23037
C8	1000 MMF 500 V	23037
C9	.0005 MFD 800 V	17185
C10	4.5-23.7 MMF	15142
C11	.0001 MFD 1200 VDCW	17208
C12	.0001 MFD 1200 VDCW	17208
C13	500 MMF 500 V	23007
C14	1000 MFD 500 V	23037
C15	SPECIAL	[illegible]
C16	SPECIAL	96130
C17	4.6-46.6 MMF	15140
C18	50 MMF 500 V	23002
C19	5000 MMF 500 V	23000
C20	50 MMF 500 V	23002
C21	0.1 MFD 400VDCW	19006
C22	SPECIAL VAR	
C23	" "	
C24	1 MFD 400 V	822006
J1	JACK 1000V	27882
J2	" 2000V	27882
J3	" ANTENNA	29703
K1	CRYSTAL - CR7	47386
K2	" "	47386
L1	INDUCTOR-OSC. CATHODE	38593
L2	" OSC. PLATE	SEE LIST
L3	" 1ST AMPLIFIER	SEE LIST
L4	CHOKE RF	38594
L5	INDUCTOR - 2ND AMPL	SEE LIST
L6	CHOKE - RF	38592
L7	CHOKE FINAL GRID	SEE LIST
L8	CHOKE RF	38592
L9	INDUCTOR-FINAL AMP PLATE	SEE LIST
L10	CHOKE RF	38592
L11	CHOKE-SCREEN	38113
L12	INDUCTOR-FINAL AMPL GRID	42058
L13	" " " GRID	42060
L14	" ANTENNA	42056
P1	CONNECTOR	28609
R1	1 MEG ½ WATT	52374
R2	120000 Ω ½ "	53049
R3	8200 " ½ "	53035
R4	2200 " ½ "	53028
R5	22000 " ½ "	53040
R6	150000 " 1 "	52276
R7	5000 " 10 "	50071
R8	295 " 1 "	50527
R9	112.8 " 1 "	50002
R10	4.3 " 1 "	50001
R11	112.8 " 1 "	50002
R12	112.8 " 1 "	50002
R13	47000 " ½ "	53044
R14	3900 " ½ "	53031
R15	470 " ½ "	53020
R16	4.3 " 1 "	50001
R17	5000 " 115 "	50525
R18	4.3 " 1 "	50001

SCHEMATIC-
MODEL 95901 (99A)
VHF RF UNIT

CLAY 9-26-52